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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/762,985	05/08/2001	Volker Becker	10191/1690	2674

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EXAMINER	
ALEJANDRO MULERO, LUZ L	

ART UNIT	PAPER NUMBER
1763	

DATE MAILED: 08/21/2003 10

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application N .	Applicant(s)
	09/762,985	BECKER ET AL.
	Examin r	Art Unit
	Luz L. Alejandro	1763

-- The MAILING DATE of this communication app ars on the cov r she t with th corr spond nc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 02 June 2003 .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 31-73 is/are pending in the application.

4a) Of the above claim(s) 31-41 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 42-73 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

~~Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).~~

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 54-59 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 54 recites the limitation " the magnetic field " in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 42-45, 47-53, and 61-71 are rejected under 35 USC 103(a) as being as obvious over Kadomura, U.S. Patent 5,662,819 in view of Collins et al., U.S. Patent 6,217,785.

Kadomura shows the invention as claimed including a method for etching a silicon body substrate using an inductively coupled plasma comprising: an ICP source 66 for generating a radio-frequency electromagnetic alternating field, a reactor (51,57) for generating the inductively coupled plasma from reactive particles by the action of the radio-frequency electromagnetic alternating field on a reactive gas, and a first means for generating plasma power pulses (see abstract) to be injected into the inductively coupled plasma by the ICP source, the method comprising the step of injecting a pulsed radio-frequency power into the inductively coupled plasma as a pulsed plasma power (see figs. 4-6 and their description).

Kadomura fails to expressly disclose matching an impedance of one of an inductive coupled plasma and the ICP source to an ICP coil generator, wherein the pulsed radio-frequency power is generated with an ICP coil generator which is pulse-operated with a frequency of 10 Hz to 1 MHz and pulse to pause ratio of 1:1 to 1:100, wherein a plasma power of 300 watts to 5000 watts on the time average is injected into the inductively coupled plasma and that the generated individual pulse powers of the radio-frequency power pulses are between 300 watts and 20 kilowatts, wherein the

magnetic field is generated in such a way that it extends into the area of the substrate and the inductively coupled plasma and has a field strength amplitude of between 10MTesla and 100mTesla in the interior of the reactor, and wherein a magnetic field pulsed at a frequency of 10Hz to 20kHz is generated via the power supply unit, the pulse to pause ratio when the magnetic field is pulsed being between 1:1 and 1:100. Collins et al. discloses utilizing a matching circuit 34 to match the impedence of the ICP coil generator 30 with the ICP source 20 (see col. 3-lines 1-18). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kadomura so as to match the impedance of the ICP coil generator with the ICP source as suggested by Collins et al. because this will maximize the efficiency of power coupling to the ICP source.

With respect to claim 43, the pulsed plasma power is injected via an ICP source to which a radio-frequency electromagnetic alternating field having a constant frequency is applied around a stationary frequency.

Concerning claims 47 and 62, Kadomura discloses generating a pulsed magnetic field, the direction of which is at least approximately or predominantly parallel to a direction defined by the connecting line of the substrate and the inductively coupled plasma.

Regarding claims 50 and 63, a pulsed radio frequency power is applied to the substrate via a substrate voltage generator.

With respect to claim 71, note that the ICP coil generator in Kadomura will inherently contain integrated components in order to ensure proper operation of the generator.

With respect to processing parameters such as the particular pulse length, power, and frequency of the RF waves as well as parameters of the magnetic field, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum values of these parameters based upon a variety of factors including the desired strength of the plasma, and would not lend patentability to the instant application absent the showing of unexpected results.

Claims 42-45, 50-54, 56-59, 61, and 63-71 are rejected under 35 USC 103(a) as being unpatentable over Savas, WO 97/14177 in view of Collins et al., U.S. Patent 6,217,785.

Savas shows the invention as claimed including a method for etching a silicon body substrate using an inductively coupled plasma comprising: an ICP source (150a, 150b) for generating a radio-frequency electromagnetic alternating field, a reactor 100 for generating the inductively coupled plasma from reactive particles by the action of the radio-frequency electromagnetic alternating field on a reactive gas, and a first means for generating plasma power pulses to be injected into the inductively coupled plasma by the ICP source, the method comprising the step of injecting a pulsed radio-frequency

power into the inductively coupled plasma as a pulsed plasma power (see fig. 1 and page 6, line 10 to page 13, line 19).

Savas is applied as above but fails to expressly disclose matching an impedance of one of an inductive coupled plasma and the ICP source to an ICP coil generator, wherein the pulsed radio-frequency power is generated with an ICP coil generator which is pulse-operated with a frequency of 10 Hz to 1 MHz and pulse to pause ratio of 1:1 to 1:100, wherein a plasma power of 300 watts to 5000 watts on the time average is injected into the inductively coupled plasma and that the generated individual pulse powers of the radio-frequency power pulses are between 300 watts and 20 kilowatts, wherein the pulse duration of the radio-frequency power injected into the substrate is between one to one hundred times, one to ten times in particular, the period of oscillation of the high-frequency fundamental component of the radio-frequency power, wherein the radio-frequency power applies a time-average power of 5 watts to 100 watts to the substrate, the maximum power of an individual radio-frequency power pulse being one to twenty times, the time average power, wherein the correlation takes place in such a way that during a radio-frequency power pulse of the ICP generator, the radio-frequency power injected into the substrate via the substrate voltage generator is switched off and/or that during a radio frequency power pulse injected into the substrate via the substrate voltage generator, the radio-frequency power injected via the ICP coil generator is switched off, where both limitations 4 and 5 occur and where the radio frequency injected into the substrate is generated during a power rise or power drop of a radio frequency power pulse injected into the plasma via the ICP coil.

Collins et al. discloses utilizing a matching circuit 34 to match the impedence of the ICP coil generator 30 with the ICP source 20 (see col. 3-lines 1-18). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Savas so as to match the impedance of the ICP coil generator with the ICP source as suggested by Collins et al. because this will maximize the efficiency of power coupling to the ICP source.

With respect to processing parameters such as the particular pulse length, power, and frequency of the RF waves as well as the synchronization between the antenna and substrate pulses, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum values of these parameters based upon a variety of factors including the desired strength of the plasma, and would not lend patentability to the instant application absent the showing of unexpected results.

With respect to claim 43, in Savas, the pulsed plasma power is injected via an ICP source to which a radio-frequency electromagnetic alternating field having a constant frequency is applied around a stationary frequency.

Concerning claims 50 and 63, in Savas, the pulsed radio frequency power 152 is applied to the substrate via a substrate voltage generator.

With respect to claims 54 and 57, note that a frequency of 13.56 MHz is used and the pulse to pause ratio of the injected radio-frequency pulses is at least greater than 1:1, and the pulses are applied simultaneously (see page 9, lines 1-28 of Savas).

With respect to claim 71, note that the ICP coil generator of Savas will inherently contain integrated components in order to ensure proper operation of the generator.

Claims 42-45, 50-53, 56-59, 61, and 63-71 are rejected under 35 USC 103(a) as being unpatentable over Koshimizu, U.S. Patent 5,935,373 in view of Collins et al., U.S. Patent 6,217,785.

Koshimizu shows the invention as claimed including a method for etching a silicon body substrate using an inductively coupled plasma comprising: an ICP source 118 for generating a radio-frequency electromagnetic alternating field, a reactor 102 for generating the inductively coupled plasma from reactive particles by the action of the radio-frequency electromagnetic alternating field on a reactive gas, and a first means for generating plasma power pulses 154 to be injected into the inductively coupled plasma by the ICP source, the method comprising the step of injecting a pulsed radio-frequency power into the inductively coupled plasma as a pulsed plasma power (see figs. 1-3B and their description).

Koshimizu is applied as above but fails to expressly disclose: matching an impedance of one of an inductive coupled plasma and the ICP source to an ICP coil generator, wherein the pulsed radio-frequency power is generated with an ICP coil generator which is pulse-operated with a frequency of 10 Hz to 1 MHz and pulse to pause ratio of 1:1 to 1:100, wherein a plasma power of 300 watts to 5000 watts on the time average is injected into the inductively coupled plasma and that the generated individual pulse powers of the radio-frequency power pulses are between 300 watts and

20 kilowatts, wherein the pulse duration of the radio-frequency power injected into the substrate is between one to one hundred times, one to ten times in particular, the period of oscillation of the high-frequency fundamental component of the radio-frequency power, wherein the radio-frequency power applies a time-average power of 5 watts to 100 watts to the substrate, the maximum power of an individual radio-frequency power pulse being one to twenty times, the time average power, wherein the frequency of the injected radio-frequency power is between 100 kHz to 100 MHz, and that the pulse to pause ratio of the injected radio-frequency pulses is between 1:1 and 1:100, and, wherein the correlation takes place in such a way that during the time of the plasma power pulses injected into the plasma via the ICP coil generator and during the time of the pulse pauses between the individual plasma power pulses injected into the plasma via the ICP coil generator, at least one radio-frequency power pulse injected into the substrate via the substrate voltage generator is applied to the substrate in each case.

Collins et al. discloses utilizing a matching circuit 34 to match the impedence of the ICP coil generator 30 with the ICP source 20 (see col. 3-lines 1-18). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Koshimizu so as to match the impedance of the ICP coil generator with the ICP source as suggested by Collins et al. because this will maximize the efficiency of power coupling to the ICP source.

With respect to processing parameters such as the particular pulse length, power, frequency of the RF waves, and synchronization between the antenna and substrate pulses, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to determine through routine experimentation the optimum values of these parameters based upon a variety of factors including the desired strength of the plasma, and would not lend patentability to the instant application absent the showing of unexpected results.

With respect to claim 43, the pulsed plasma power in Koshimizu is injected via an ICP source to which a radio-frequency electromagnetic alternating field having a constant frequency is applied around a stationary frequency.

Regarding claims 50 and 63, a pulsed radio frequency power is applied to the substrate via a substrate voltage generator in Koshimizu. Also, note that the pulsing of the injected plasma power and the pulsing of the radio-frequency power injected into the substrate via the substrate voltage generator are time-correlated or synchronized with each other in Koshimizu.

Furthermore, with respect to claims 56-58, the correlation takes place in Koshimizu so that during a portion of the time in which the power pulse of the ICP generator is switched on, the radio-frequency power injected to the substrate is switched off, and the correlation also takes place so that during a portion of the time in which the radio-frequency power pulse is injected to the substrate, the power injected to the ICP generator is switched off. Additionally, during another portion of the time the power pulse to the ICP generator or the RF power injected to the substrate is turned on, the RF power and ICP generator, respectively, are also on. Also, the radio frequency power applied to the substrate can be generated during a power rise of a radio frequency power pulse injected into the plasma via the ICP coil generator.

With respect to claim 71, note that the ICP coil generator of Koshimizu will inherently contain integrated components in order to ensure proper operation of the generator.

Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,662,819 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 47-53, and 61-71 and further in view of Koshimizu, U.S. Patent 5,997,687.

Kadomura and Collins et al. are applied as above but fail to expressly disclose wherein the pulsing of the radio-frequency power is accompanied by a change of the frequency of the injected radio-frequency power, the frequency change being controlled in such a way that the plasma power injected into the inductively coupled plasma during the pulsing is maximized. Koshimizu discloses shifting the frequency higher during pulse plasma processing to enhance the ignition of the plasma (see abstract). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kadomura modified by Collins et al. so as to shift the frequency of the pulses higher as suggested by Koshimizu in order to improve the ignition of the plasma.

Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,662,819 in view of Collins et al., U.S. Patent 6,217,785 as

applied to claims 42-45, 47-53, and 61-71 and further in view of Laermer et al., U.S. Patent 5,501,893.

Kadomura and Collins et al. are applied as above but fails to expressly disclose wherein the etching takes place in alternating etching and passivation steps at a process pressure of 5 microbars to 100 microbars. Laermer et al. discloses performing alternating etching and passivation steps at a process pressure of 10 to 100 microbars (see fig. 1 and col. 4-line 23 to col. 5-line 65). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kadomura modified by Collins et al. so as to perform the etching process of Laermer et al. because this is a suitable process to be performed in a plasma etching apparatus.

Claim 46 is rejected under 35 USC 103(a) as being unpatentable over Savas, WO 97/14177 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 50-54, 56-59, 61, and 63-71 and further in view of Koshimizu, U.S. Patent 5,997,687.

Savas and Collins et al. are applied as above but fail to expressly disclose wherein the pulsing of the radio-frequency power is accompanied by a change of the frequency of the injected radio-frequency power, the frequency change being controlled in such a way that the plasma power injected into the inductively coupled plasma during the pulsing is maximized. Koshimizu discloses shifting the frequency higher during pulse plasma processing to enhance the ignition of the plasma (see abstract). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to modify the process of Savas modified by Collins et al. so as to shift the frequency of the pulses higher as suggested by Koshimizu in order to improve the ignition of the plasma.

Claim 60 is rejected under 35 USC 103(a) as being unpatentable over Savas, WO 97/14177 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 50-54, 56-59, 61, and 63-71 and further in view of Laermer et al., U.S. Patent 5,501,893.

Savas and Collins et al. are applied as above but fails to expressly disclose wherein the etching takes place in alternating etching and passivation steps at a process pressure of 5 microbars to 100 microbars. Laermer et al. discloses performing alternating etching and passivation steps at a process pressure of 10 to 100 microbars (see fig. 1 and col. 4-line 23 to col. 5-line 65). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Savas modified by Collins et al. so as to perform the etching process of Laermer et al. because this is a suitable process to be performed in a plasma etching apparatus.

Claims 47-49, 55, and 62 are rejected under 35 USC 103(a) as being unpatentable over Savas, WO 97/14177 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 50-54, 56-59, 61, and 63-71 and further in view of Lymberopoulos et al., U.S. Patent 6,085,688.

Savas and Collins et al. are applied as above but fails to expressly disclose a pulsed magnetic field and the parameters of the magnetic field as claimed along with the applying the magnetic field first, before a radio frequency power pulse of the ICP generator, and the magnetic field is switched off again after the decay of the radio-frequency power pulse.

Lymberopoulos et al. discloses applying a pulsed magnetic field in an area of the substrate and perpendicular to a line between the substrate and an ICP source in order to control the plasma (see figs. 5, 10-13, and abstract). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Savas modified by Collins et al. to apply a pulsed magnetic field as taught by Lymberopoulos et al. because the pulsed magnetic field can be used to selectively control plasma density or to selectively confine process gas species (see last two lines of abstract).

With respect to processing parameters such as the strength of the magnetic field and frequency of the pulses of the magnetic field as well as the synchronization of the magnetic and antenna pulses, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum values of these parameters based upon a variety of factors including the desired strength of the plasma, and would not lend patentability to the instant application absent the showing of unexpected results.

Claim 46 is rejected under 35 USC 103(a) as being unpatentable over Koshimizu, U.S. Patent 5,935,373 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 50-53, 56-59, 61, and 63-71 and further in view of Koshimizu, U.S. Patent 5,997,687.

Koshimizu, U.S. Patent 5,935,373 and Collins et al. are applied as above but fail to expressly disclose wherein the pulsing of the radio-frequency power is accompanied by a change of the frequency of the injected radio-frequency power, the frequency change being controlled in such a way that the plasma power injected into the inductively coupled plasma during the pulsing is maximized. Koshimizu '687 discloses shifting the frequency higher during pulse plasma processing to enhance the ignition of the plasma (see abstract). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Koshimizu '373 modified by Collins et al. so as to shift the frequency of the pulses higher as suggested by Koshimizu '687 in order to improve the ignition of the plasma.

Claim 60 is rejected under 35 USC 103(a) as being unpatentable over Koshimizu, U.S. Patent 5,935,373 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 50-53, 56-59, 61, and 63-71 and further in view of Laermer et al., U.S. Patent 5,501,893.

Koshimizu and Collins et al. are applied as above but fails to expressly disclose wherein the etching takes place in alternating etching and passivation steps at a process pressure of 5 microbars to 100 microbars. Laermer et al. discloses performing

alternating etching and passivation steps at a process pressure of 10 to 100 microbars (see fig. 1 and col. 4-line 23 to col. 5-line 65). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Koshimizu modified by Collins et al. so as to perform the etching process of Laermer et al. because this is a suitable process to be performed in a plasma etching.

Claims 47-49, 54-55, and 62 are rejected under 35 USC 103(a) as being unpatentable over Koshimizu, U.S. Patent 5,935,373 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 50-53, 56-59, 61, and 63-71 and further in view of Lymberopoulos et al., U.S. Patent 6,085,688.

Koshimizu and Collins et al. are applied as above but fail to expressly disclose a pulsed magnetic field and the parameters of the magnetic field as claimed along with the applying the magnetic field first, before a radio frequency power pulse of the ICP generator, and the magnetic field is switched off again after the decay of the radio-frequency power pulse.

Lymberopoulos et al. discloses applying a pulsed magnetic field in an area of the substrate and perpendicular to a line between the substrate and an ICP source in order to control the plasma (see figs. 5, 10-13, and abstract). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Koshimizu modified by Collins et al. to apply a pulsed magnetic field as taught by Lymberopoulos et al. because the pulsed magnetic field can

be used to selectively control plasma density or to selectively confine process gas species (see last two lines of abstract).

With respect to processing parameters such as the strength of the magnetic field and frequency of the pulses of the magnetic field as well as the synchronization of the magnetic and antenna pulses, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum values of these parameters based upon a variety of factors including the desired strength of the plasma, and would not lend patentability to the instant application absent the showing of unexpected results.

Claims 72-73 are rejected under 35 USC 103(a) as being unpatentable over Kadomura, U.S. Patent 5,662,819 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 47-53, and 61-71 and further in view of Wilbur, U.S. Patent 6,020,794.

Kadomura and Collins et al. are applied as above but fail to expressly disclose wherein the ICP coil generator causes a variation of the frequency of the radio-frequency electromagnetic alternating field so that the impedance is matched as a function of the pulsed plasma power to be injected, so as to provide rapid switching between the plasma power pulses and interpulse periods. Wilbur discloses wherein the ICP coil generator 13 causes a variation of the frequency of the radio-frequency alternating field so that the impedance within the plasma chamber is matched (see abstract and fig. 1 and its description). In view of this disclosure, it would have been

obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kadomura modified by Collins et al. so as to perform the impedance matching of Wilbur because this will improve the power efficiency of the plasma apparatus.

Claims 72-73 are rejected under 35 USC 103(a) as being unpatentable over Savas, WO 97/14177 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 50-54, 56-59, 61, and 63-71 and further in view of Wilbur, U.S. Patent 6,020,794.

Savas and Collins et al. are applied as above but fail to expressly disclose wherein the ICP coil generator causes a variation of the frequency of the radio-frequency electromagnetic alternating field so that the impedance is matched as a function of the pulsed plasma power to be injected, so as to provide rapid switching between the plasma power pulses and interpulse periods. Wilbur discloses wherein the ICP coil generator 13 causes a variation of the frequency of the radio-frequency alternating field so that the impedance within the plasma chamber is matched (see abstract and fig. 1 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Savas modified by Collins et al. so as to perform the impedance matching of Wilbur because this will improve the power efficiency of the plasma apparatus.

Claims 72-73 are rejected under 35 USC 103(a) as being unpatentable over Koshimizu, U.S. Patent 5,935,373 in view of Collins et al., U.S. Patent 6,217,785 as applied to claims 42-45, 50-53, 56-59, 61, and 63-71 and further in view of Wilbur, U.S. Patent 6,020,794.

Koshimizu and Collins et al. are applied as above but fail to expressly disclose wherein the ICP coil generator causes a variation of the frequency of the radio-frequency electromagnetic alternating field so that the impedance is matched as a function of the pulsed plasma power to be injected, so as to provide rapid switching between the plasma power pulses and interpulse periods. Wilbur discloses wherein the ICP coil generator 13 causes a variation of the frequency of the radio-frequency alternating field so that the impedance within the plasma chamber is matched (see abstract and fig. 1 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Koshimizu modified by Collins et al. so as to perform the impedance matching of Wilbur because this will improve the power efficiency of the plasma apparatus.

Response to Arguments

Applicant's arguments with respect to claims 42-60 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 703-305-4545. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on 703-308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Luz L. Alejandro
Primary Examiner
Art Unit 1763

August 11, 2003